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ABSTRACT

Neurological data indicate that the universal aptitude for functional language is biologically based, species specific, and developmental. The universality of functional oral speech is indisputable. Everyone, however, does not exhibit similar expertise in processing oral and visual language. Many people can speak two languages functionally but read functionally in neither. Is visual language a generically distinct and substantively more difficult type of processing than oral language or are children taught to read in a way that does not optimally conform to the essential nature and organization of the brain? Children are taught a set of nonlinguistic skills which do not equal reading. The appropriateness of the skills is decided on the basis of whether they result in communicative processing of visually initiated language, which is reading. Is a nonlinguistic approach to reading the optimal instructional approach? The neuropsychological literature predicts that language aptitude cannot be reliably accessed by nonlinguistic channels. Bilingual children should be taught through their primary language, but the instruction must be linguistic in nature. A reading curriculum should increase the probabilty that students will be able to transfer their oral language ability to the problem of reading. The optimal method should be based on basic communicative strategies which introduce vocabulary, syntax, and subject matter compatible with the major channel of language processing. (Author/CFM)

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Neurological Research on Language and the Implications for Teaching Bilingual Children to Read

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In the early sixties, a surgical procedure for isolating hemispheres of the brain was developed. This procedure was employed to confine the detrimental influence of a malignant tumor to the side of the brain in which it originated. The hemispheres are actually two separate brains which are anatomically identical; and they communicate with each other across central commissures. With the development of special surgical techniques, these commissures were severed, and interhemispheric communication could be restricted.

For example, the left hemisphere controls the contralateral right field of the body and the right hemisphere controls the left field. By placing a divider against a person's face, objects can be shown to one hemisphere at a time. Similarly, using earphones, auditory information can be selectively channeled to a single hemisphere. With this simple experimental paradigm, Sperry and Gazzaniga (1967) noted that when a picture of a cat was presented only to the right visual field, and thus confined to the left hemisphere, the split-brain patient facilely identified the presentation. Correspondingly, when the same picture was selectively channeled to the right hemisphere, there was no difficulty recognizing it. When the letters "CAT" were exposed to the left hemisphere, the person effortlessly read it as "cat". However, when the same word, already identified correctly by the left hemisphere, was exposed to the right hemisphere, the person was unable to identify it. Presenting different types of stimuli to one side of the brain at a time, Sperry and Gazzaniga observed that certain neural activities were either confined to or concentrated within a single hemisphere. Linguistic functions and higher order ratiocination were restricted to the dominant hemisphere, which is usually the left side of the brain. The precise function of the nondominant hemisphere is still largely unknown. However, the nondominant hemisphere does excell in tasks that require nonlinguistic spacial and acoustic discrimination. This research decisively corroborates centuries of historical records on aphasia, records which indicated that there are discrete areas of the brain to process disparate types of information.

Eric Lenneberg (1967), in a complementary set of research studies, noted that soldiers who had lost aspects of their language ability due to lesions incurred during the wars, were unable to redevelop their damaged or lost linguistic functions. Inversely, children who suffered lesions that resulted in aphasia were able to partially or wholly relocate the impaired functions within the

nondominant hemisphere. The crucial developmental point for this neurological recovery is puberty. Lenneberg postulated that language aptitude is therefore a species specific and physically developmental trait which persists until puberty. He provided additional support for this premise by observing that there are physical milestones which all children progressively achieve within a certain time frame. The emergence of linguistic milestones, such as the use of the passive and the negative, is correlated to the appearance of these physical milestones. If language is truely a biologically based and developmental trait, then the appearance of linguistic milestones in children who are developmentally retarded should be in the identical synchronomy as the appearance of linguistic milestones in developmentally normal children. Lenneberg documented that the growth of developmental retardates is characterized by the same synchronomy.

Brown (1973) discussed an experiment with patients at a veteran's hospital. Three groups, one with spinal cord disabilities, one with right hemisphere disabilities, and one with left hemisphere disabilities, were required to point to a sequence of pictures in the same order as the experimenter had demonstrated. All groups reacted comparably. But, when the experimental design was changed and the groups were required to point to the pictures in the order the experimenter has used verbally, the patients with left hemisphere injuries were significantly less accurate than patients with right hemisphere injuries, and the latter group was less accurate than the group with spinal cord diseases. The research on aphasia and split-brain surgery conclusively substantiates that there are distinct neural processing points for linguistic and nonlinguistic operations. The preceding research on sequencing argues that linguistic seriation and nonlinguistic seriation may also be discrete.

This latter hypothesis is indicated by experiments reviewed by the Russian neurologist Luria (1967). A group of children between 16 and 18 months old were taught to correctly pick up a toy fish or a toy horse when the experimenter asked for the appropriate item. However, when the horse was placed further away than the fish and the experimenter asked the children to retrieve the horse, they, looking at the horse, grabbed the fish. Children between 22 and 24 months consistenly chose the appropriate object independent of proximity. This and congruent experiments suggets that though children have the ability to discriminate between objects, they don't necessarily apply this discrimination to performance tasks. Young children's linguistic and performance organization, which, like syntax, depends on seriation, may therefore at first be separate. Linguistic seriation seems to precede performance seriation and the two later become developmentally conjoined.

There is neurological data to indicate that the universal aptitude for functional language is biologically based, species specific, and developmental. This aptitude and its prerequisite components appear to be discrete from commensurate operations

involved in logical, nonlinguistic processes. That language is a separate processing system is indicated by case histories of persons with neurologically impaired language processes. After extensively studying the speech patterns of aphasiacs, Howes (1967) concluded that aphasia is not a quantitative loss in verbal items but is rather the loss of patterns of processing. Since aphasia does not necessitate a concomitant reduction in logical ability, this research supports the independence of linguistic and logical processes. These distinctive language processes are a priori, that is the organizational structures precede the utterance of any particular statement and are the condition for comprehending any sentence. This notion of a priori or synthetic structures is, of course, the assumption on which the possibility of transformational grammar is contingent. Literally, the general corpus of research in neuropsychology over the past twenty-five years has been in direct support of the possibility and the necessity of recognizing neural operations as synthetic. As early as 1951, Lashley wrote a famous paper assembling evidence from prominent neuropsychologists which convincingly demonstrated that neural processes could not even remotely duplicate the patterns of extraneural phoneomena. Language comprehension is neurologically feasible only in terms of synthetic organizational schemata which do not mirror the surface properties of specific utterances.

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Whether one recognizes the universal language aptitude of a normal population as a biological trait, the universality of functional oral speech is beyond cavil. Why is it that everyone does not exhibit similar expertise in processing oral and visual language? Why is it that numerous people can speak two languages functionally but read functionally in neither? Is visual language a generically distinct and substantively more difficult type of processing than oral language? Or have we traditionally taught children to read in a way that does not optimally conform to the essential nature and organization of the brain?

How have we traditionally taught children to read? Children learn the alphabet, how to reproduce letters in proper orientation, spelling, phonics, naming words out of context, oral recitation to a rote criterion, and the other skills which are generally accepted as the precondition to reading. None of these skills, by themselves or in sum, equals reading. Using the skills just listed, I could pick up a Spanish passage and, with clear enunciation, faultlessly phoneticize the text. However, after completing my recital, you could ask me questions about the material I'd just processed. If I were unable to paraphrase that material, you would not recognize my performance as reading. What I have learned is a set of nonlinguistic skills. These skills are not themselves reading; they are only teaching expedients. The appropriateness of the skills can only be decided on the basis of whether they result in communicative processing of visually initiated language,

which is reading. However, a sizeable proportion of persons do not, having been exposed to traditional instructional expedients, learn to read functionally. Is a noncommunicative, and therefore nonlinguistic, approach to reading the optimal instructional approach?

Research in neuropsychology indicates that only one hemisphere can be in primary command during a learning task (Sperry, 1961). If conflicting information is presented to the two hemispheres, one becomes dominant and suppresses the functioning of the other. An instance of this relation is performance on the Stroop Test. In this test persons are required to read passages in which certain words are written in different colors of ink. For example a sentence could read that, "Marcia munched on the yellow banana." However, the word yellow is printed in brown ink. The correct oral reading becomes progressively more difficult as the test words shift from nonsense words to rare vocabulary, common words, words with color related meanings, color names distant on the spectrum from the color of the ink, and color names close to the color of the ink (Klein, 1964). Therefore, as the linguistic appropriateness of the word increases, it becomes relatively more difficult for the tested person to suppress the linguistic processing and respond to nonlinguistic perceptual cues. This research, executed in experimental psychology on the basis of work independent of that which we've discussed, is congruent with and predicted by the neuropsychological literature. Correspondingly, the neuropsychological literature predicts that nonlinguistic teaching expedients which emphasize noncommunicative attention to spacial and acoustic features will result in linguistic confusion. The literature predicts that language aptitude, despite its universality, cannot be reliably accessed by nonlinguistic channels. Language ability is neuropsychologically discrete from nonlinguistic ability; it is physically based and developmentally separate from nonlinguistic processes; it is an independent, synthetic system the components of which developmentally precede comparable components involved in nonlinguistic processes. Linguistic processes interact homeostatically with nonlinguistic neural functions so that only one or the other can be dominant at the same time.

What are the implications of these research themes for teaching bilingual children to read? This research argues against a simplistic panacea that one merely has to translate traditional reading exercises into a child's primary language for those exercises to be effective. If a child has a primary and a secondary language, then certainly the most efficient means of teaching that child will be through the major channel of communication. However, if the instruction is to be maximally accessible through that major channel, it must be linguistic in nature. And, similarly, if we are goin to recommend strategies to improve the efficiency of visual language processing, those strategies must be linguistic in nature. A method of insuring that a curriculum is in a linguistic format, is by an emphasis on basics, but not an emphasis on expediential teaching basics. A reading curriculum should increase the probability that students will

be able to transfer their oral language ability to the problem of reading. The optimal method of organizing a curriculum to efficiently teach bilingual children to read would be a method which builds on basic communicative strategies, which introduces vocabulary, syntax, and subject matter compatible with the major channel of language processing, and which assures that students understand and accept the communicative rationale for strategies intended to aid in accessing that linguistically compatible material.